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# Glossary of health informatics terms

**Algorithm**-A process for carrying out a complex task broken down into simple decision and action steps. Often assists the *requirements analysis* process carried out before programming.

**Bioinformatics**-The use of *health informatics* methods to aid or facilitate research in molecular biology.

**Checklist**-A type of *clinical decision tool*: A form listing one or more items of *patient data* to be collected before, during or after an encounter; can be paper or computer based.

**Clinical coding system (clinical thesaurus, controlled vocabulary)**-A limited list of preferred terms from which the user can draw one or more to express a concept such as *patient data*, a disease or drug name, etc. An alphanumeric code corresponding to the term is then stored by the computer. Synonyms or close matches to each preferred term are usually also available and map onto the same internal codes. This approach makes it easier for a computer to analyse data than the use of free text words or phrases. Examples of clinical coding systems include SNOMED-CT (divergent codes used to capture *patient data*), MeSH (terms used to index biomedical literature) and ICD-10 (convergent codes for international comparisons, with specific rules to guide coders). Clinical coding systems play a key role in epidemiological studies and health service research, from the use of MeSH terms to conduct literature searches for systematic reviews to numerous studies which use ICD codes to classify and compare diseases. To prevent information loss, it is vital that the terms and codes are never changed or dropped, only added to. Obsolete terms can be marked as such to deter inappropriate use. Continuing maintenance is needed to incorporate new terms and codes for new concepts and new synonyms as they arise.

**Clinical data system**-Any information system concerned with the capture, processing or communication of *patient data*.<sup>1</sup>

**Clinical decision tool**-Any mechanical, paper or electronic aid that collects data from an individual patient to generate output that aids clinical decisions during the doctor-patient encounter.<sup>2</sup> Examples include *decision support systems*, paper or computer reminders and checklists, which are potentially useful tools in *public health informatics*, as well as other branches of health informatics.

**Clinical information**-Organised *patient data* or *clinical knowledge* used to make clinical decisions (adapted from Shortliffe et al<sup>3</sup>); may also include *directory information*. Many activities in public health and epidemiology (e.g. surveillance systems, cohort studies to assess the effects of a risk factor of disease and clinical trials to estimate efficacies of new treatments) involve the organisation of such data (e.g. case report forms for individual patients) into useable information (e.g. incidence of notifiable cases of disease from surveillance programmes and summary evidence from cohort studies or clinical trials, expressed as odds ratios for certain harmful and beneficial outcomes). See also: *information*.

**Clinical informatics**-The use of *health informatics* methods to aid management of patients, employing an interdisciplinary approach, including the clinical and information sciences.<sup>3</sup>

**Communication**-The exchange of *information* between agents (human or automated) face to face or using paper or electronic media.<sup>4</sup> Requires the use of a shared language and understanding or common ground.

**Computer vision (image interpretation)**-The use of computer techniques to assist the interpretation of images, such as mammograms.

**Confidentiality (protecting privacy)**-The policies restricting access to a person's data to those whom the patient agrees need access to it, except rarely in emergency and for the public good (e.g. to contain epidemics, allow important research to be undertaken or solve serious crime). In addition, other regulatory and institutional approval may be needed (e.g. the need to seek consent from medical ethics committees or relevant national authorities). In recent years, leading public health researchers have warned that legislation enacted to protect patients' medical data in the UK, Europe and US could potentially hamper observational research and medical record linkage studies.<sup>5 6</sup>

**Consumer health informatics**-The use of *health informatics* methods to facilitate the study and development of paper and electronic systems which support public access to and the use of health and lifestyle information. For additional discussion on the scope of consumer health informatics, see Eysenbach.<sup>7</sup> See also *eHealth*.

**Data quality**-The degree to which data items are accurate, complete, relevant, timely, sufficiently detailed, appropriately represented (e.g. consistently coded using a *clinical coding system*) and retain sufficient contextual information to support decision making.

**Database**-A collection of data in machine readable format organised so that it can be retrieved or processed automatically by computer. A flat file database is organised like a card file, with many records (cards) each including one or more fields (data items). A relational database is organised as one or more related tables, each containing columns and rows. Data are organised in a database according to a schema or data model; some items are often coded using a *clinical coding system*.

**Decision support system (computer decision aid)**-A type of *clinical decision tool*: a computer system that uses two or more items of *patient data* to generate case or encounter-specific advice.<sup>8</sup> Examples include computer risk assessors to estimate cardiovascular disease risk<sup>9</sup> and the Leeds Acute Abdominal Pain system, which aids the diagnosis of conditions causing such pain.<sup>10</sup> Evidence-adaptive decision support systems are a type of decision aid with a knowledge base that is constructed from and continually adapts to new research- and practice-based evidence.<sup>11</sup>

**Decision tree**-A way to model a complex decision process as a tree with branches representing all possible intermediate states or final outcomes of an event. The probabilities of each intermediate state or final outcome and the perceived utilities of each are combined to attach expected utilities to each outcome. The science of drawing decision trees and assessing utilities is called decision analysis.

**Directory information**-*Information* specific to an organisation or service which is useful in managing public health services, health care services or patients. Examples include a phone directory, a lab handbook listing available tests and tubes to use, and a list of the drugs in the local formulary.

**eHealth**-The use of internet technology by the public, health workers and others to access health and lifestyle information, services and support; it encompasses *telemedicine*, *telecare* etc. For in-depth discussion on the scope and security issues of eHealth, see a report by the National HealthKey Collaborative.<sup>12</sup>

**Electronic health record (EHR)**-In the UK, the lifelong summary of a person's health episodes, assembled from summaries of individual *electronic patient records* and other relevant data.<sup>13</sup>

**Electronic patient record (EPR)**-A computer-based *clinical data system* designed to replace paper patient records.

**Evaluating health information systems:** Measuring or describing the key characteristics of an information system, such as its quality, usability, accuracy, clinical impact or cost effectiveness.<sup>14</sup> Generally, information systems can be evaluated using standard health technology assessment methods.

**Explicit knowledge**-Knowledge that can be communicated on paper or electronically, without person-to-person contact.<sup>15</sup> Health workers and physicians cannot use explicit knowledge if they cannot access it. There is thus a need to identify, capture, index and make available explicit knowledge to professionals, a process called codification. Much of the work done by the Cochrane Collaboration involves codification of explicit knowledge. See also: *tacit knowledge*.

**Geographical information system (GIS)**-Computer software which captures, stores, processes and displays location as well as other data. The display may preserve distance ratios between data objects (e.g. true scale maps) or link similar objects, ignoring distance (e.g. topological maps such as that distributed to the public for the London Underground). GIS software is used in many ecological studies of disease. A famous example is Peto's study of diet, mortality and lifestyle in rural China.<sup>16</sup> Disease mapping studies have also been conducted to assess childhood leukaemia in areas with different radon levels,<sup>17</sup> the clustering of respiratory cancer cases in areas with a steel foundry<sup>18</sup> and socio-economic gradients in infant mortality.<sup>19</sup> GISs are also used for public health planning and surveillance purposes at local or national health departments. Care should be taken by policy makers in interpreting maps produced by GIS software, particularly in regard to the ecological fallacy.<sup>20</sup>

**Health informatics (medical informatics)**-The study and application of methods to improve the management of *patient data*, *medical knowledge*, population data and other *information* relevant to patient care and community health. Unlike some other definitions of health or medical informatics (e.g. Greenes and Shortliffe<sup>21</sup>), this definition puts the emphasis on information management rather than technology. Branches of health informatics include *bioinformatics*, *clinical informatics*, *consumer health informatics* and *public health informatics*.

**Information**-Organised data or knowledge used by human and computer agents to reduce uncertainty, take decisions and guide actions (adapted from Shortliffe et al<sup>3</sup> and Wyatt<sup>22</sup>). See also: *clinical information*, *patient data*, *medical knowledge*.

**Information design**-The science and practice of designing forms, reports, books etc. so that the *information* they contain can be found rapidly and interpreted without error (adapted from Sless<sup>23</sup>). Information design is based on psychological and graphical design theories and a large number of empirical studies of human perception and decision making using alternative formats for *information*.

**Knowledge base**-A store of knowledge which is represented explicitly so that a computer can search and reason with it automatically; often uses a *clinical coding system* to label the concepts. See also *decision support system*.

**Knowledge based system (expert system)**-A computer *decision support system* with an explicit *knowledge base* and separate reasoner program which uses this to give advice or interpret data, often *patient data*.

**Knowledge management**-The identification, mobilisation and use of knowledge to improve decisions and actions. In public health and medicine, much of this work involves the management of *medical knowledge* (from epidemiological studies, randomised-controlled trials and systematic reviews) so that it is

actually used by the physician. This entails clinical practices *innovation*<sup>24</sup> or narrowing the gap between what we know and what we do. The NHS is developing a programme of knowledge codification to inform routine problem solving, e.g. through the National Electronic Library of Health, guidelines from the National Institute of Clinical Excellence (NICE), and care pathways and triage algorithms used in the NHS Direct Clinical Advice System.<sup>25</sup>

**Medical knowledge (clinical knowledge)**-*Information* about diseases, therapies, interpretation of lab tests etc., and potentially applicable to decisions about multiple patients and public health policies, unlike *patient data*. This information should where possible be based on sound evidence from clinical and epidemiological studies, using valid and reliable methods. See also: *explicit knowledge*, *tacit knowledge*, *knowledge management*.

**Minimum data set**-A list of the names, definitions and sources of data items needed to support a specific purpose, such as surveillance of the health of a community, investigation of a research hypothesis or monitoring the quality of care in a *registry*.

**Patient data**-*Information* about an individual patient and potentially relevant to decisions about her current or future health or illness. Patient data should be collected using methods that minimise systematic and random error. See also: *medical knowledge*.

**Public health informatics**-the use of *health informatics* methods to promote "public health practice, research and learning", employing an interdisciplinary approach, including the public health sciences, e.g. epidemiology and health services research, and the information sciences, e.g. computing science and technology (adapted from Yasnoff et al<sup>26</sup>). In a recent paper outlining an agenda for developing this branch of informatics, Yasnoff et al<sup>27</sup> argued for the need to construct, implement and integrate public health surveillance systems at national and local levels, to enable rapid identification and response to disease hotspots (and more topically, bioterrorism). As Yasnoff rightly points out, methods of assessing costs and benefits of such systems are needed. Public health informatics can also contribute in other areas, e.g. reminders have played an important role in prevention programmes such as smoking cessation advice to smokers<sup>28</sup> and the use of preventive care for patients.<sup>29</sup>

**Registry**-A *database* and associated applications which collects a *minimum data set* on a specified group of patients (often those with a certain disease or who have undergone a specific procedure), health professionals, organisations or even clinical trials. Registries can be used to explore and improve the quality of care or to support research, for example to monitor long term outcomes or rare complications of procedures. Key issues in registries are maintaining *confidentiality*, coverage of the target population and *data quality*.

**Reminder**-A type of *clinical decision tool* which reminds a doctor about some item of *patient data* or *clinical knowledge* relevant to an individual patient that they would be expected to know. Can be paper- or computer-based; includes *checklists*, sticky labels on front of notes, an extract from a guideline placed inside notes or computer-based alerts. There has been much interest in reminders as an *innovation method* recently because of the poor uptake of practice guidelines, even those based on good quality evidence. An example is in the treatment of dyslipidaemia in primary care, where there is a big gap between recommendations and actual practice.<sup>30</sup>

**Requirements analysis**-The process of understanding and capturing user needs, skills, and wishes before developing an information system (adapted from Somerville<sup>31</sup>). See *software engineering*.

**Security**—The technical methods by which *confidentiality* is achieved.<sup>12</sup>

**Software engineering**—The process of system development, documentation, implementation and upgrading (adapted from Somerville<sup>31</sup>). In the classical or “waterfall” model of software engineering, *requirements analysis* leads to a document which serves as the basis for a system specification and *database* schema, from which programmers work to develop the software. However, increasingly, users and software designers work together from the start to develop and refine a prototype system. This helps to engage the users, educate the software development team, brings the requirements documents alive and allows users to explore how their requirements might change due to interaction with the new software.

**Tacit knowledge (intuition)**—Knowledge that requires person-to-person contact to transfer and cannot be communicated on paper or electronically.<sup>15–25</sup> Over time, some tacit knowledge can be analysed, decomposed and made explicit. See also: *explicit knowledge*.

**Telecare**—A kind of *telemedicine* with the patient located in the community (e.g. their own home); see also *eHealth*.

**Telemedicine**—The use of any electronic medium to mediate or augment clinical consultations. *Telemedicine* can be simultaneous (e.g. telephone, videoconference) or store and forward (e.g. an email with an attached image).

**Additional resources:** Readers who are interested in general coverage of the field of health informatics are encouraged to refer to standard texts.<sup>32–33</sup> Those who are interested in alternative or complementary definitions of the above terms can look up various sources.<sup>3–4–34–36</sup>

#### Notes to the list of concepts:

*Italic* means “see also”

Synonyms are mentioned in brackets, after the core term

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